DOCUMENT RESUME

ED 269 747 CS 008 449

AUTHOR Topp, Bruce W.; And Others
TITLE Schema Instantiation and the Acquisition and Reconstruction of New Knowledge from Text.
PUB DATE Apr 86
NOTE 5p.; Paper presented at the Annual Meeting of the American Educational Research Association (70th, San Francisco, CA, April 16-20, 1986).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Higher Education; Inferences; *Learning Processes; *Learning Theories; *Reader Text Relationship; *Reading Processes; *Reading Research; Recall (Psychology); *Schemata (Cognition)

ABSTRACT

A study tested the hypothesis that readers continually evaluate the informational content of text in terms of its relevance to processing goals and congruence with existing knowledge, and that they prioritize this information in terms of its strategic importance to the task at hand, integrating it with existing schemata when it is compatible. Subjects, 180 college students placed in one of three conditions, read versions of a story with differing cues, information types, and themes. After reading, the subjects completed a free recall measure and a 60-item recognition test. Results indicated that when the text contained two distinct and contrasting types of information, the context established at the time of encoding affected what statements the subjects judged to be true. Their inferences appeared to be similarly affected. Manipulation of the retrieval context had little or no effect on subjects' recognition of these statements. In addition, recall of one type of information was maximized when schemata established at encoding and retrieval were consistent, while incongruent contexts served only to muddle the process of reconstruction. (Graphs illustrating the results are included.) (FL)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED269747

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
X This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Bruce W. Topp
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

Schema Instantiation and the Acquisition and Reconstruction of New Knowledge from Text

BRUCE W. TOPP
Lockheed Missiles & Space Co., Inc.
RAYMOND W. KULHAVY
KATHLEEN S. WEBB
Arizona State University

Bruce W. Topp, Ph.D.
Lockheed Missiles & Space Co., Inc.
Organization 66-91, Building 567
1111 Lockheed Way
Sunnyvale, CA 94086

When instantiated in the context of reading, a learner's schemata affect what aspects of text will be deemed important and later remembered. For example, when directed to assume a perspective while reading, learners are more likely to recall details that are relevant to that perspective (Anderson, Pichert, & Shirey, 1983; Pichert & Anderson, 1977). Similarly, encoding schemata, whether cued or "naturally occurring", are integral components of the process of interpretation and comprehension when discourse has multiple meanings or is ambiguous (Anderson, Reynolds, Schallert, & Goetz, 1977; Bransford & Johnson, see also Goetz (1979).

Extant research reveals that schemata affect the process of recall and retrieval, as well. As early as Bartlett (1932) it was shown that remembering is largely a reconstructive process; a learner's prior knowledge assists in coherently organizing memory traces of that which was read. Thus, a shift in perspective or the introduction of new information at the time of recall may allow the learner to retrieve information that was previously inaccessible or may force the reconciliation of incompatible details of the encoding and retrieval contexts (Anderson, Pichert, & Shirey, 1983; Fass & Schumacher, 1981; Spiro, 1977).

Despite these important contributions, no one, to our knowledge, as systematically examined the relative effect of encoding, recall, and naturally-occurring schemata in a single study. Hence, our objective in this investigation was to disentangle the complicated roles of schemata in knowledge assimilation and reconstruction to expose dependencies between these processing contexts.

Our strategy was to construct a passage with opposing arguments while manipulating themes and cues to provide all possible combinations of three encoding and recall contexts. To avoid utter confusion on the part of the reader these themes and cues had to be written so they could be combined (even though in opposition) and still make sense in light of the passage. For this reason we constructed a story about a murder trial containing an equal number of prosecution and defense arguments. Themes concerned the jury's verdict in the trial while recall cues concerned the defendant's actual culpability. After free recall, subjects were administered a recognition test and asked to classify statements as true, false, or not explicitly stated (NS) in the passage. An inference was later scored when an NS statement was mistakenly classified as true.

Our general hypothesis was that readers continually evaluate the informational content of text in terms of its relevance to processing goals and congruence with existing knowledge. This information is prioritized in terms of its strategic importance to the task at hand and integrated when compatible with existing schemata. When the processing goal changes at recall (e.g. perspective shifts) it is reasonable to assume that some extraneous details become more important and thus easier to retrieve.

CS 008 449

Conversely, other information may be judged as irrelevant during encoding and therefore not integrated. We reasoned that while a new retrieval schema may allow learners to recall limited additional information, details (a) not initially integrated or (b) of an extremely low priority, will not be remembered. We therefore expected that cuing schemata at the time of encoding would have a far greater impact on subjects' recall of relevant details than cues provided at the time of retrieval, and that the effectiveness of a cue would be largely determined by it's compatibility with an established theme. In addition, since readers are more likely to make inferences when relations are deemed important in a story (Goetz, 1979), we expected that the above described effects would generalize to the inferences made by learners.

Method

Subjects and Design. The sample comprised 180 undergraduate volunteers assigned in equal numbers to three theme and three cue conditions. Thus, the design was a three theme (guilty, innocent, control) by three cue (guilty, innocent, control) by two information type (defense, prosecution) mixed factorial with repeated measures on the last factor. Number of defense and prosecution arguments recalled and classified served as dependent measures in the study.

Experimental Text, Themes, and Cues. The experimental text was a 570-word story concerning a murder trial containing ten pairs of prosecution and defense arguments presented in a counterbalanced fashion. Theme statements were one-sentence declarations concerning the jury's verdict in the trial: The jury's verdict was guilty, innocent, or unanimous. Recall cues addressed the true guilt or innocence of the defendant: In fact, the defendant was guilty, innocent, or given a fair trial. To ensure that themes and cues were processed, each was partitioned into three simple segments which were scrambled. All 180 subjects successfully unscrambled and wrote their theme and cue.

Recall and Recognition Measures. In addition to free recall, subjects completed a 60-item recognition test containing 20 statements that were true, 20 that were false, and 20 that were not explicitly stated (NS) in the passage. Thus, a true, false, and NS statement was constructed for each argument. A norming sample of 27 students read the passage and completed the recognition test, classifying each statement as true, false, or NS. When less than 70 percent of subjects concurred with our classification of 14 statements, they were revised and resubmitted to smaller samples until no further modifications were necessary. The items were randomized in blocks of fifteen to form three sequences of presentation totaling four pages. The four pages were then shuffled and stapled in a test booklet.

Free recall protocols were scored by an assistant who was blind to subjects' group assignment. Independent scoring of 10 percent of the sample yielded an inter-rater reliability of .88. The recognition test was scored for number of true and false statements correctly classified as well as the number of times an NS statement was incorrectly identified as true.

Procedure. Subjects wrote the story's theme and were allowed four minutes to read the passage which was then collected. After unscrambling and writing their recall cue, participants were provided a blank sheet of paper and given 10 minutes to write down everything they could remember from the passage. At the completion of free recall, subjects were given the remaining class time to complete the recognition (statement classification) test.

Results and Discussion

Recognition Test. Analysis of true statement recognition yielded a two-way interaction between type of statement recognized (defense, prosecution) and type of theme $F(1,171) = 3.92$, $p < .05$ (Figure 1). While the recognition of true prosecution statements was relatively constant across the three theme conditions, subjects who read the "innocent" theme correctly classified a greater number of true defense statements than the other conditions. No significant effects for type of information, themes, cues, or their interaction were found for subjects' classification of false statements, suggesting that these statements functioned primarily as distractors in the test. Concerning subjects' inferences, only type of information reached conventional levels of significance $F(1,171) = 4.97$, $p < .05$; learners were more likely to make inferences about prosecution arguments. A non-significant ($p < .15$) interaction between theme condition and type of information recalled was, however, in the expected direction; subjects reading the innocent theme identified more defense NS statements as true than prosecution NS statements (Figure 2).

Free recall. Analysis of free recall revealed a significant three-way interaction between theme, cue, and type of information recalled, $F(4,171) = 2.39$, $p = .05$. Simple effects tests revealed a significant effect due to cue, for defense information and after the innocent theme. In other words, the amount of defense information recalled by subjects assigned the innocent theme differed significantly depending on the cue they unscrambled. Examination of the complicated interaction depicted in Figure 3 is relatively straightforward if one mentally projects vertical lines corresponding to each theme condition. For the upper half of the figure (defense information), the three highest points correspond to the guilty theme/guilty cue; control theme/control cue, and innocent theme/innocent cue. Following the same procedure for prosecution information, the high scores correspond to the guilty theme/guilty cue, control theme/control cue, and innocent theme/control cue. All but one of these groups had similar encoding and retrieval contexts, suggesting that consistency of these schemata was an important determinant of what would be remembered from the passage. When themes and cues were incompatible (e.g. innocent/guilty) recall was inhibited, at least for defense information.

The results of this study show that when text contains two distinct and contrasting types of information, the context established at the time of encoding will affect what statements concerning the passage are later judged to be true. The inferences made by learners appear to be similarly affected, although this was not clearly demonstrated. As expected, manipulation of the retrieval context had little or no effect on subjects' recognition of these statements. In the case of free recall, the encoding context was again implicated as an important determinant what would be remembered. More important, however, was the relation between encoding and retrieval contexts. In this study, recall of one type of information was maximized when schemata established at encoding and retrieval were consistent; incongruent contexts served only to muddle the process of reconstruction. These findings suggest that the context of encoding may place important boundary conditions on the effectiveness of recall schemata and further suggest that Tulving and Thompson's (1973) encoding specificity principle may, in fact, hold implications for the processing of connected discourse.

BEST COPY AVAILABLE

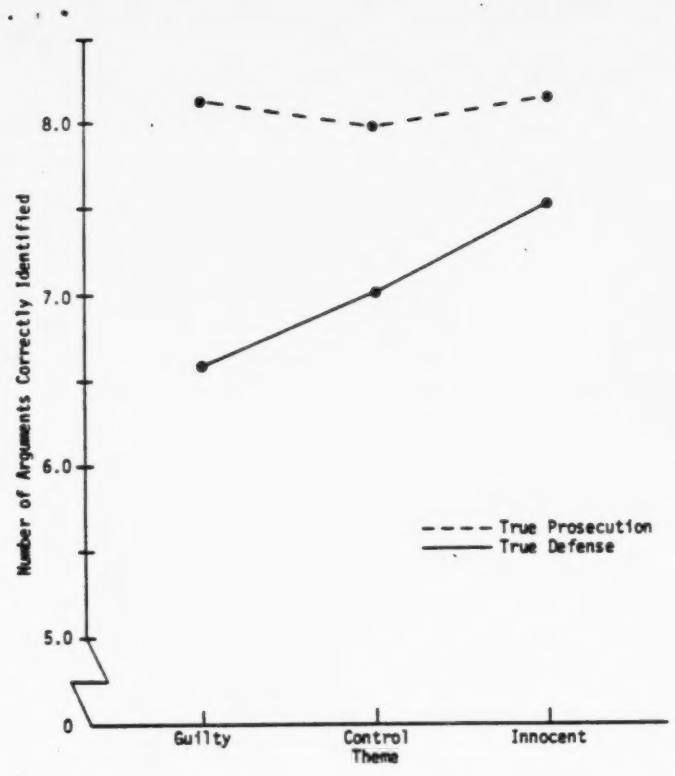

Figure 1. Interaction between theme and type of true statement recognized.

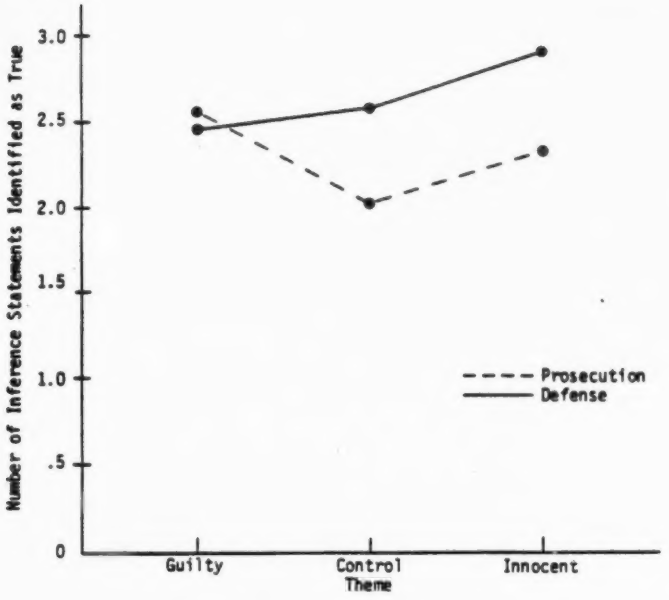

Figure 2. Non-significant interaction between theme and type of inference.

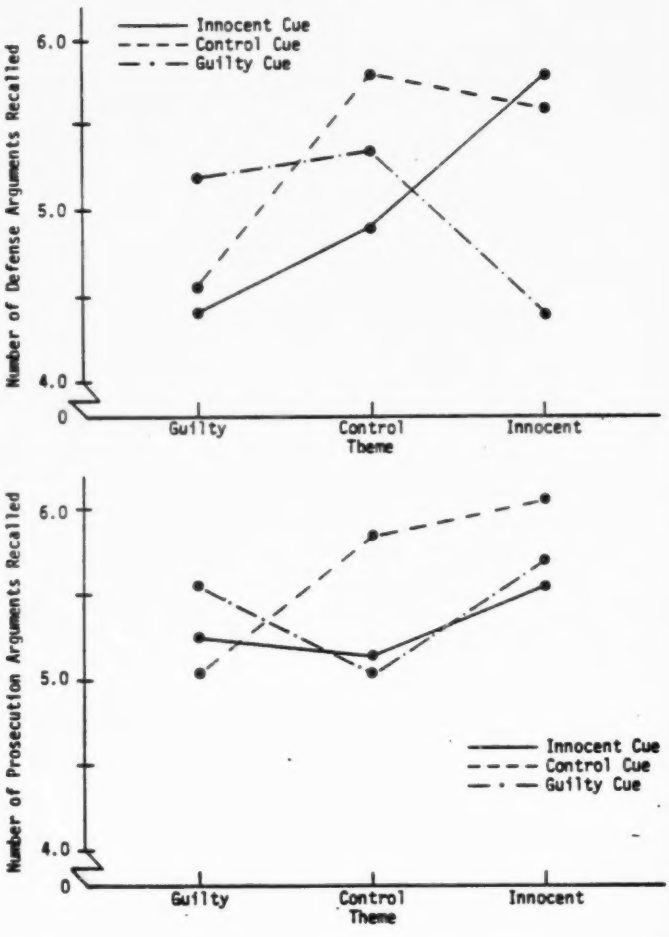

Figure 3. Interaction between theme, cue, and type of information recalled.